

PTO 06-2790

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05-219401

TELEVISION RECEIVER

(Terebijon Juzoki)

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UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D. C.

February 2006

Translated by: Schreiber Translations, Inc.

Country : Japan
Document No. : 05-219401
Document Type : Kokai
Language : Japanese
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Applicant : Hitachi Co., Ltd.
IPC : H 04 N 5/00
5/44
5/57
H 04 Q 9/00
Date of Filing : February 3, 1992
Publication Date : August 27, 1993
Foreign Language Title : Terebijon Juzoki
English Title : TELEVISION RECEIVER

SPECIFICATION

(54) Title of the Invention

TELEVISION RECEIVER

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[Claims]

[Claim 1] A television receiver detecting the distance between a remote controller and a television receiver, which is characterized by providing a signal generating means outputting two signals with different propagation speeds from the remote controller and a distance detecting means receiving the signals outputted from the signal generating means to calculate the distance from a phase difference.

[Claim 2] A television receiver according to Claim 1, which is characterized by providing a magnification control means controlling the amount of magnification of a picture by the output of said distance detecting means.

[Claim 3] A television receiver according to Claim 1, which is characterized by providing

¹Numbers in the margin indicate pagination in the foreign text.

a mixing control means controlling the amount of mixing a right voice with a left voice and the amount of mixing a left voice with a right voice by the output of said distance detecting means.

[Claim 4] A television receiver according to Claim 1, which is characterized by using an infrared ray and an ultrasonic wave for said two signals with different propagation speeds.

[Claim 5] A television receiver according to Claim 1, which is characterized by using an infrared ray and a sonic wave for said two signals with different propagation speeds.

[Detailed Description of the Invention]

[0001]

[Field of Industrial Application] The present invention relates to a television receiver, and particularly to a control mode for controlling various settings in accordance with audiovideo environment of a viewer to optimally adjust a picture.

[0002]

[Prior Art] Recent television receivers have been variously modified to improve the performance of TV. For a fuzzy AI vision described in *TV Gijutsu (TV Technol.)*, No. 1 (1999) among these modifications, a method wherein the brightness and quality of a picture are controlled in accordance with a distance from a viewer to a TV so that they are always adjusted to become an optimum picture by inputting the distance from a remote controller. [0003] Operations of this TV are described below. Fig. 3 is a diagram showing a control with a conventional remote controller. 1 is a remote controller, and 2 is a television receiver.

[0004] A viewer closes a power supply of the television receiver, and then selects "How far is the distance between television receiver and remote controller?" by a button of remote controller. Information selected by the button is sent to the television receiver and inputted to a mounted PC. The picture control is performed by PC according to a distance between television receiver and remote controller. For example, the contrast is reduced and the speed modulation is weakened in case of a near distance. The contrast is increased and the speed modulation is intensified in case of a far distance. It can reproduce fine details at a near distance, and can increase the contrast, intensify the speed modulation and make the contour

clear to give a modulation in tone to the picture at a far distance.

[0005]

[Problem to Be Solved by the Invention] In the above conventional example, a viewer visually measures the distance from the television receiver beforehand by the distance information inputted to the remote controller. Next, the viewer selects a distance in conformity to the distance from a near, medium or far distance by the remote controller. Subsequently, the PC mounted on the television receiver performs the picture control on the basis of the inputted distance information. Therefore, the viewer had to input the distance information he visually measured from the remote controller. If the viewer did not input the distance information, the performance originally held by the television receiver was not said to be fully manifested.

[0006] An object of present invention consists in solving the above problem and providing a system wherein an optimum picture control is performed only simply by operating a remote controller even if distance information is not consciously inputted.

[0007]

[Means for Solving the Problem] The above object is achieved by providing a signal generating means outputting two signals with different propagation speeds from a remote controller and a calculating means calculating the distance outputted from the remote controller by a television receiver.

[0008]

[Actions] If a key of remote controller is depressed, the signal generating means outputting two signals with different propagation speeds generates a signal of high propagation speed and a signal of low propagation speed and outputs the signals in the same phase simultaneously.

[0009] The calculating means calculating the distance from a signal outputted from the remote controller by a television receiver detects a phase difference of said two signals outputted from the remote controller. The detected phase difference is based on a difference of propagation speeds of the two signals, therefore the distance can be calculated back from the phase difference.

[0010]

[Actual Examples] Actual examples of the present invention are described below. Fig. 1 shows Actual Example 1 of the present invention, **101** is a reference signal generator, **102** is a

remote controller button, **103** is an ultrasonic oscillator, **104** is an infrared ray emitter, **105** is an ultrasonic receiver, **106** is an infrared ray receiver, **107** is a distance detector, and **108** is an output terminal.

[0011] Next, operations of the circuit are described. The reference signal generator **101** generates a sine wave as a reference signal for detecting a distance. If the remote controller button **102** is depressed, the generated sine wave is inputted to the ultrasonic oscillator **103** and the infrared ray emitter **104**. The sine wave inputted into the ultrasonic oscillator **103** is converted to an ultrasonic signal and outputted from the remote controller. On the other 3 hand, the sine wave inputted to the infrared ray emitter **104** is converted to an infrared ray and outputted from the remote controller.

[0012] The ultrasonic signal outputted from the remote controller is inputted to the ultrasonic receiver **105** of the television receiver. The inputted ultrasonic signal is converted to the original sine wave by the ultrasonic receiver **105** and inputted to the distance detector **107**. The infrared ray outputted from the remote controller is inputted to the infrared ray receiver **106** of the television receiver. The inputted infrared ray is converted to the original sine wave by the

infrared ray receiver **106** and inputted into the distance detector **107**.

[0013] A phase difference of the sine wave propagated by the ultrasonic wave inputted into the distance detector **107** and the sine wave propagated by the infrared ray is detected. The distance between the remote controller and the television receiver is calculated from the detected phase difference according to the frequency of sine wave generated by the remote controller, the propagation speed of ultrasonic wave and the propagation speed of infrared ray. As a result, information of distance between the remote controller and the television receiver is obtained at the output terminal **108**.

[0014] Next, a method of distance calculation is described by Fig. 2. Even though the infrared ray and the ultrasonic wave outputted from the remote controller have the same frequency, but they have different propagation speeds, therefore their phases when reaching the television receiver are different. Here, as shown in Fig. 2, if the distance between television receiver and remote controller is x , the phase when an infrared ray outputted from the remote controller in a phase of 0° reaches the television receiver is $N1$, the phase when an ultrasonic wave outputted from the remote controller in a phase of 0° reaches the television receiver is $N2$, the frequency of sine wave is f , the

propagation speed of infrared ray is v_1 , and the propagation speed of ultrasonic wave is v_2 , the distance x is obtained by Math 1. For example, the infrared ray propagates

[0015]

[Math 1]

[Math 1]

$$x = \frac{1}{f} \frac{N_2 - N_1}{\frac{1}{v_2} - \frac{1}{v_1}}$$

[0016] at the same speed as that of light, therefore its propagation speed is 300,000 km/s. By contrast, the propagation speed of ultrasonic wave similarly is the propagation speed of sound 330 m/s. Therefore, if the wavelength of reference frequency is selected as the maximum observation distance or above and a difference between the phases N_1 when the infrared ray reaches the television receiver and the phase N_e when the ultra-sonic wave reaches the television receiver is detected, the distance between remote controller and television receiver can be found.

[0017] Next, a processing algorithm in case of processing the distance by PC, etc. is illustrated by Fig. 8. First, $1/f$ is found from the frequency of signal output from the remote

controller and the propagation speeds v_1 , v_2 . Then, the difference N_s of phase N_1 , N_2 outputted from the infrared ray receiver **106** and the ultrasonic receiver **105** is found. The distance x is found from the obtained $1/8$ and N_s . Here, the processing algorithm using PC, etc. was shown, but the distance x may also be calculated by an exclusive hardware.

[0018] Moreover, an ultrasonic wave was selected as one of signals having a different propagation speed in this actual example, but any signal having a propagation speed of same degree may be used, and a sonic wave may also be used. When a sonic wave is used, a reference signal for distance detection may also be multiplexed in information of voice or music, etc. Any signal having a propagation speed of same degree as an infrared ray may be used, and a visible light may also be used. Furthermore, a sine wave was used as reference signal output from the remote controller in this actual example, but any signal capable of detecting the phase may also be used.

[0019] Next, a system applying the distance detection mode of present invention is described. Fig. 4 is a block diagram showing a picture magnification system applying the distance detection mode of present invention. In the diagram, **201** is a horizontal synchronous input terminal, **202** is a vertical synchronous input terminal, **203** is a distance detection signal

input terminal, **204** is a horizontal deflection circuit, **205** is a vertical deflection circuit, **206** is a horizontal deflection yoke, **207** is a vertical deflection yoke, and **208** is a Braun's tube.

[0020] Next, operations of the circuit are described. A horizontal synchronous signal inputted from the input terminal **201** is input to the horizontal deflection circuit **204** to decide a start time of horizontal deflection. A vertical synchronous signal inputted from the vertical synchronous input terminal **202** is input to the vertical deflection circuit **205** to decide a start time of vertical deflection. The horizontal deflection circuit **204** prepares a deflection signal necessary for driving the horizontal deflection yoke **206** and outputs it to the horizontal deflection yoke **206**. The vertical deflection circuit **205** prepares a deflection signal necessary for driving the vertical deflection yoke **207** and outputs it to the vertical deflection yoke **207**. The horizontal deflection yoke **206** and the vertical deflection yoke **207** deflect an electronic beam of Braun's tube **208** horizontally and vertically by the inputted deflection signals to display a picture. /4

[0021] The horizontal deflection circuit **204** and the vertical circuit **205** are connected to the distance detection signal input terminal **203** and operate so as to change the

deflection angle according to the distance between television receiver and remote controller. For example, in a case of short distance, a picture with the deflection angles intact is displayed as shown in Fig. 5(a). By contrast, in case of far distance, the deflection angle increases and the display contents are magnified as shown in Fig. 5(b), therefore a picture is easily seen from far. Thus, a picture of optimum size corresponding to the distance can be enjoyed by controlling the deflection angle in accordance with the distance information.

[0022] Moreover, the magnification method of picture using the deflection circuit was shown here, but an image signal may also be magnified by interpolating scanning lines.

[0023] Next, the second system applying the distance detection mode of present invention is described. Fig. 6 is a surround system applying the distance detection mode of present invention. In the diagram, **301** is a left voice signal input terminal, **302** is a right voice signal input terminal, **303** is a distance detection signal input terminal, **304**, **305** are coefficient multipliers, **306**, **307** are subtractors, **308**, **309** are amplifiers, **310** is a left speaker, and **311** is a right speaker.

[0024] Next, operations of the circuit are described. A left voice inputted from the left voice signal input terminal **301** is inputted to the subtractor **306** and the coefficient

multiplier **304**. A right voice inputted from the right voice signal input terminal **302** is inputted to the subtractor **307** and the coefficient multiplier **305**. The left voice inputted to the coefficient multiplier **304** is magnified k times and inputted to the subtractor **307**. The right voice inputted to the coefficient multiplier **305** is magnified k times and inputted to the subtractor **306**. The subtractor **306** subtracts the right voice magnified k times from the left voice and output it. The subtractor **307** subtracts the left voice magnified k times from the right voice and output it. The voice signal outputted from the subtractor **306** is amplified by the amplifier **308** and outputted from the left speaker **301**. The voice signal outputted from the subtractor **307** is amplified by the amplifier **309** and outputted from the right speaker **311**.

[0025] The distance detection signal input terminal **303** is connected to the coefficient multipliers **304**, **305**, the coefficient k is controlled in accordance with inputted distance information to change the spread of surround sound. This state is described by Fig. 7. When a common stereo broadcast is outputted, as shown in Fig. 7(a), a right sound and a left sound are mixed nearby the center to give a stereo feeling. However, the sounds of left and right speakers cannot be differentiated and the stereo feeling is thinned for a viewer going far away

from the speakers. Accordingly, as shown in Fig. 7(b), if only a little k -times right voice magnified k times is output from the left speaker and only a little left voice magnified k times is output from the right speaker, the sound magnified k times nearby the center is negated by the voice output from the opposite speaker, and the spread of sound is felt. Accordingly, the coefficient k is controlled so as to reduce it when the distance between television receiver and remote controller is near, and the coefficient k is controlled so as to increase it when the distance between television receiver and remote controller is far. Thereby, a surround corrected stereo feeling is obtained likewise even if the distance changes. Moreover, the coefficient k must not be greater than 1.

[0026] The two signals with different propagation speeds may be used not only for detecting the distance, but also for sending two different kinds of information. The ultrasonic oscillator **103** of Fig. 1 can be used for receiving a vibrator of said oscillator, therefore a peripheral sound of remote controller may be received by it and sent to TV as level of peripheral sound of a viewer. It enables to perform a control of increasing the volume when the level of peripheral sound of remote control-ler is high.

[0027]

[Effects of the Invention] As described above, the present invention enables to calculate the distance between remote controller and television receiver only by depressing a button of remote controller, therefore it has an effect of no such a trouble that a viewer must visually measure the distance. Moreover, the present invention enables to perform the detection of distance by signals with different propagation speeds, therefore it has an effect capable of accurately measuring it.

[0028] Furthermore, the present invention has an effect capable of controlling the amount of magnification of a picture and the spread of surround sound in accordance with the measured distance.

[Brief Description of the Drawings]

[Fig. 1] Block diagram showing one actual example of present invention.

[Fig. 2] Schematic diagram describing an actual example of present invention.

[Fig. 3] Schematic diagram describing a conventional example.

[Fig. 4] Block diagram showing Actual Example 1 of present invention.

[Fig. 5] Diagrams showing a state of picture of Actual Example 1 of present invention.

[Fig. 6] Diagrams showing a state of picture of Actual Example 2 of present invention.

[Fig. 7] Diagrams showing a state of Actual Example 2 of present invention.

[Fig. 8] Diagram showing a processing algorithm for performing the distance calculation of present invention.

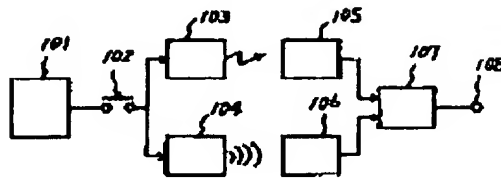
[Description of the Symbols]

- 101 | reference signal generator
- 102 | button of remote controller
- 103 | ultrasonic oscillator
- 104 | infrared ray emitter
- 106 | infrared ray receiver
- 107 | distance detector

/5

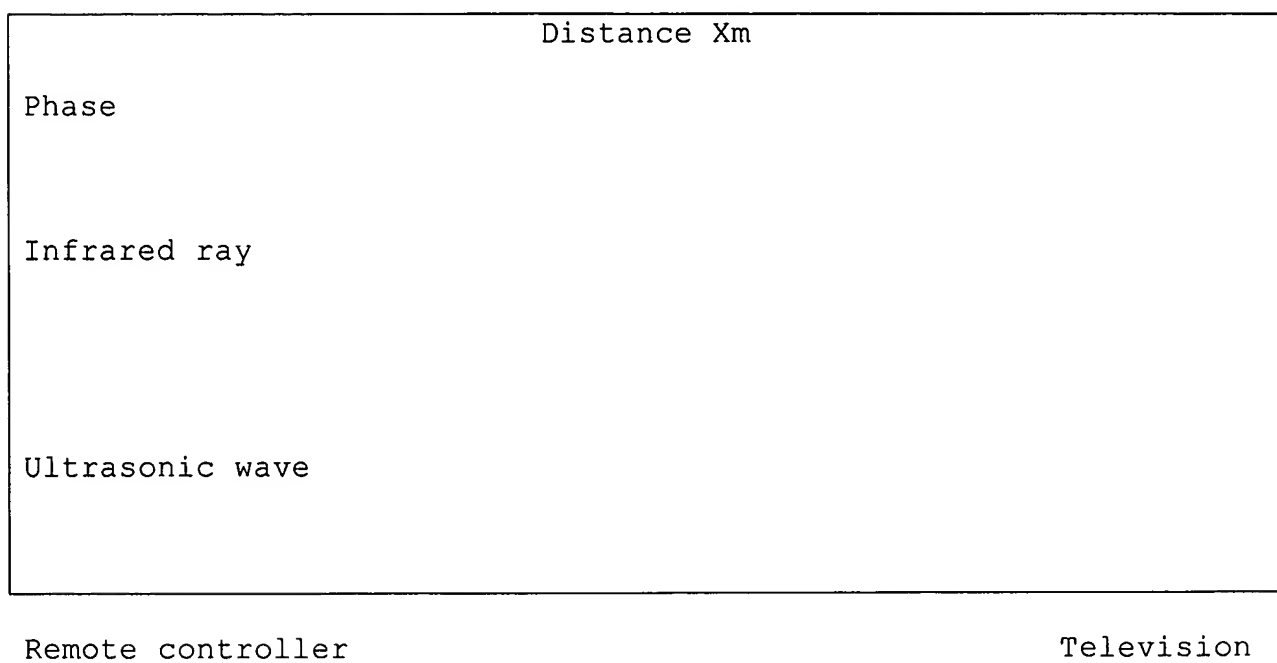
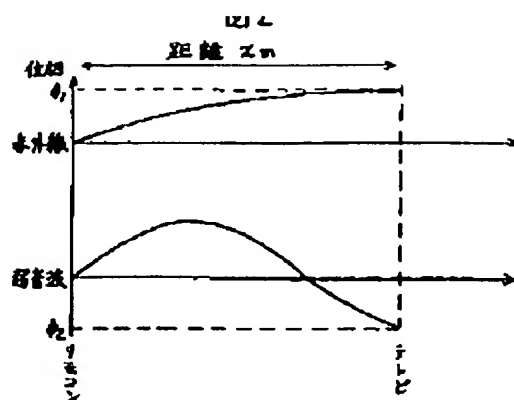
[Fig.1]

Fig. 1



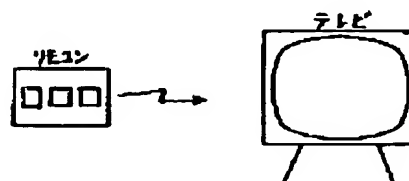
[Fig. 2]

Fig. 2



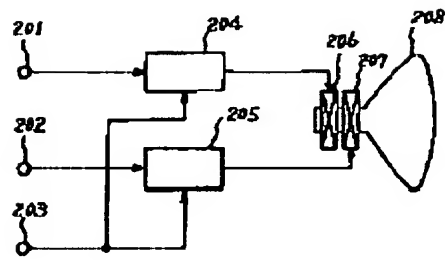
[Fig. 3]

Fig. 3



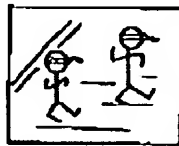
[Fig. 4]

Fig. 4

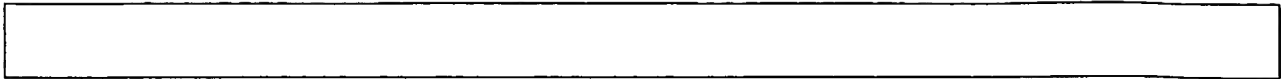


[Fig. 5]

Fig. 5

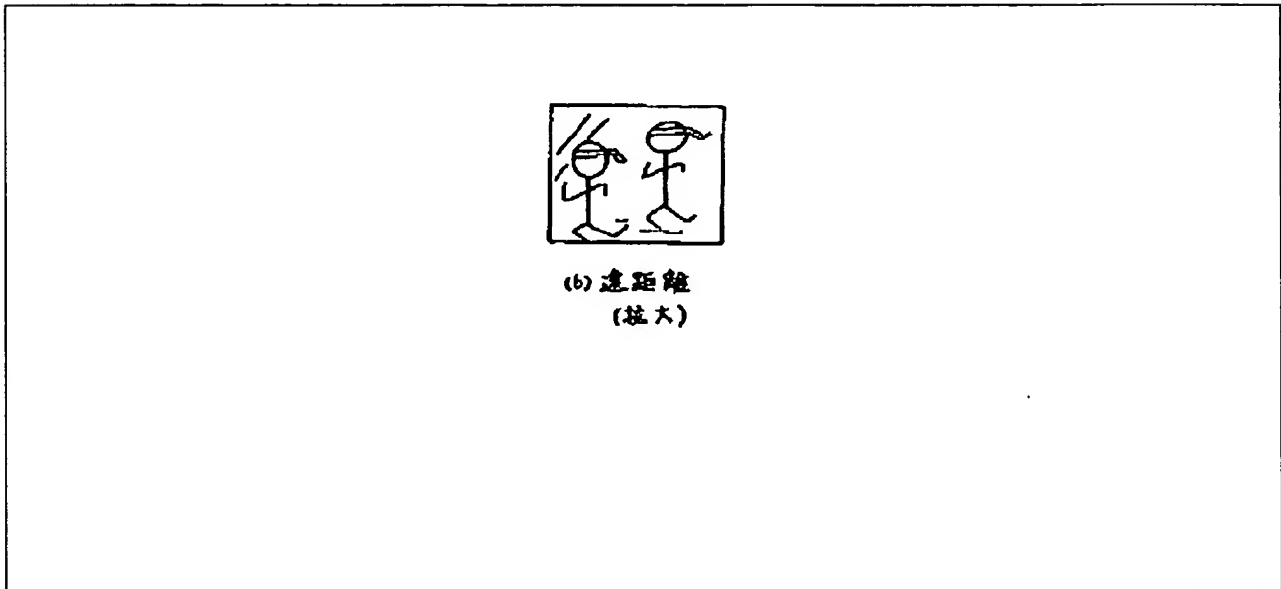


(a) 近距離
(格闘)



(a) Near distance

(standard)

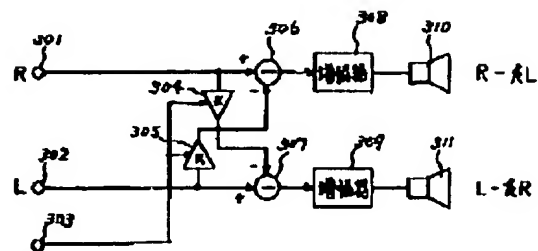


(b) Far distance

(magnified)

[Fig. 6]

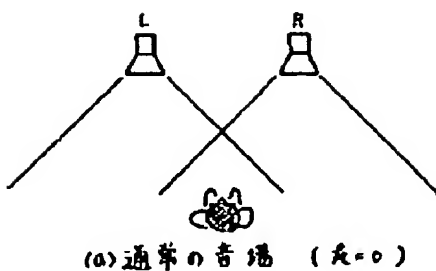
Fig. 6



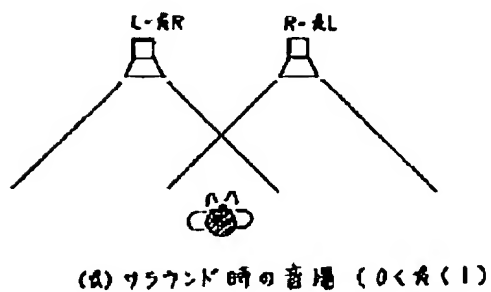
[Fig. 7]

Fig. 7

(a) common sound field ($k < 0$)



(b) sound field in surround $0 < k < 1$



[Fig. 8]

Fig. 8

□ 8

$$\frac{1}{\lambda} \cdot f\left(\frac{1}{v_2} \cdot \frac{1}{v_1}\right)$$



$$\phi_s = \phi_2 - \phi_1$$



$$\tau = \frac{\phi_s}{\lambda}$$

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